Listing of Claims:

1-34. (Canceled)

35. (Original) A method for detecting faults in a control loop for a pneumatically operated control valve, the control loop including an actuator, second stage pneumatics having a control fluid valve assembly responsive to a pressure signal for controlling flow of control fluid to the actuator, an I/P converter adapted to receive an I/P drive signal and generating the pressure signal, and a processor for delivering the I/P drive signal to the I/P converter, the method comprising:

defining a normal range for a control parameter of the control loop;

triggering a fault signal for operation of the control parameter outside the normal range;

characterizing operating parameters of the control loop during the fault signal to derive a fault template;

comparing the fault template to sets of stored operating parameters associated with specific component failures; and

identifying at least one specific component failure having a set of stored operating parameters that matches the fault template.

36. (Original) The method of claim 35, in which the second stage pneumatics comprises a spool valve, and in which the control parameter comprises a spool valve position signal.

37. (Original) The method of claim 35, in which the second stage pneumatics comprises a pneumatic relay having a beam, and in which the control parameter comprises a beam position signal.

38. (Original) The method of claim 35, in which the control parameter comprises an I/P drive signal.

39. (Original) The method of claim 35, in which characterization of the operating parameters includes:

characterizing an I/P drive signal deviation as high or low;

characterizing an error signal as largely positive, null, or largely negative, wherein the error signal is equal to a reference signal minus an actuator travel signal;

characterizing an outlet port differential pressure as negative, nominal, or positive, wherein the outlet port differential pressure is equal to a first outlet port pressure minus a second outlet port pressure; and

characterizing a control fluid valve assembly position as largely positive, null, or largely negative.

40. (Previously Presented) The method of claim 39, in which characterization of the operating parameters further includes characterizing the reference signal after the I/P drive signal deviation has been characterized but before the error signal, outlet port differential pressure, and control fluid valve assembly position have been characterized.

41. (Original) The method of claim 39, in which a fault template comprising a high I/P drive signal deviation, largely positive error signal, negative outlet port differential pressure, and largely negative control fluid valve assembly position is attributable to one of a group of component faults consisting of a jammed spool valve, an inlet O-ring failure, a diaphragm failure, and a blocked primary orifice.

42. (Original) The method of claim 39, in which a fault template comprising a high I/P drive signal deviation, largely positive error signal, nominal outlet port differential pressure, and largely positive control fluid valve assembly position is attributable to one of a group of component faults consisting of an external leak, a worn spool valve, and a low supply pressure.

43. (Original) The method of claim 39, in which a fault template comprising a high I/P drive signal deviation, largely positive error signal, nominal outlet port differential pressure, and largely negative control fluid valve assembly position is attributable to a low supply pressure.

44. (Original) The method of claim 39, in which a fault template comprising a high I/P drive signal deviation, largely positive error signal, positive outlet port differential pressure, and largely positive control fluid valve assembly position is attributable to one of a group of component faults consisting of a throttling element stuck at low travel, a blocked air line, and an active interlock.

45. (Original) The method of claim 39, in which a fault template comprising a high I/P drive signal deviation, null error signal, nominal outlet port differential pressure, and null control fluid valve assembly position is attributable to one of a group of component faults consisting of a partially plugged primary orifice, grit in the armature, and a shift in I/P calibration.

46. (Original) The method of claim 39, in which a fault template comprising a low I/P drive signal deviation, largely negative error signal, positive outlet port differential pressure, and largely positive control fluid valve assembly position is attributable to one of a group of component faults consisting of a blocked I/P nozzle, a pressed I/P armature, a latched I/P, and a jammed spool valve.

47. (Original) The method of claim 39, in which a fault template comprising a low I/P drive signal deviation, largely negative error signal, negative outlet port differential pressure, and largely negative control fluid valve assembly position is attributable to one of a group of component faults consisting of a valve stuck in a high position and a blocked air line.

48. (Original) The method of claim 39, in which a fault template comprising a low I/P drive signal deviation, null error signal, nominal outlet port differential pressure, and null control fluid valve assembly position is attributable to one of a group of component faults consisting of a shift in I/P calibration and a partially plugged I/P nozzle.

49. (Original) A control loop for positioning a throttling element of a pneumatically operated control valve, the control loop comprising:

an actuator for driving the throttling element, the actuator defining first and second control chambers;

second stage pneumatics having an inlet port in fluid communication with a control fluid supply, first and second outlet ports in fluid communication with the first and second actuator control chambers, respectively, and a control fluid valve assembly for controlling flow of control fluid from the inlet port to the first and second outlet ports;

an I/P converter having a pressure-responsive diaphragm engaging the control fluid valve assembly, the I/P converter further including an inlet in fluid communication with the control fluid supply and an outlet for directing control fluid to the diaphragm;

at least one sensor for detecting an operating parameter;

a processor communicatively coupled to the at least one sensor for providing a drive signal to the I/P converter; and

a diagnostics unit communicatively coupled to the processor, the diagnostics unit including a memory programmed to:

define a normal range for the operating parameter;

trigger a fault signal for operation of the control parameter outside of the normal range;

characterize operating parameters of the control loop during the fault signal to derive a fault template;

compare the fault template to sets of stored operating parameters associated with specific component failures; and

identify at least one specific potential component failure having a set of stored operating parameters corresponding to the fault template.

50. (Original) The control loop of claim 49, in which the control fluid valve assembly comprises a spool valve, and in which the control parameter comprises a spool valve position signal.

51. (Original) The control loop of claim 49, in which the control fluid valve assembly comprises a pneumatic relay having a beam, and in which the control parameter comprises a beam position signal.

52. (Original) The control loop of claim 49, in which the control parameter comprises an I/P drive signal.

53. (Original) The control loop of claim 49, in which the at least one sensor comprises an inlet port sensor in fluid communication with the second stage pneumatics inlet port, a first outlet port sensor in fluid communication with the second stage pneumatics first outlet port, a second outlet port sensor in fluid communication with the second stage pneumatics second outlet port, and a displacement sensor for determining a control fluid valve assembly position, and in which the memory is programmed to:

characterize an I/P drive signal deviation as high or low;

characterize an error signal as largely positive, null, or largely negative, wherein the error signal is equal to a reference signal minus an actuator travel signal;

characterize an outlet port differential pressure as negative, nominal, or positive, wherein the outlet port differential pressure is equal to a first outlet port pressure minus a second outlet port pressure; and

characterize the control fluid valve assembly position as largely positive, null, or largely negative.

54. (Previously Presented) The control loop of claim 53, in which the memory is further programmed to characterize the reference signal after the I/P drive signal deviation has been characterized but before the error signal, outlet port differential pressure, and control fluid valve assembly position have been characterized.

55. (Currently Amended) A method for detecting faults in a control loop for a pneumatically operated control valve, the control loop including an actuator, a control fluid valve assembly adapted to receive a pressure signal and control flow of control fluid to the actuator, an I/P converter coupled to the control fluid valve assembly, and a processor for delivering an I/P drive signal to the I/P converter, the method comprising:

monitoring the I/P drive signal and at least one operating parameter of the control loop during normal operation of the control valve;

generating a fault signal based on the I/P drive signal and the at least one operating parameter in accordance with a logic sub-routine.

56. (Original) The method of claim 55, in which the at least one operating parameter comprises a control fluid valve assembly position.

57. (Original) The method of claim 56, in which the fault signal is generated when the I/P drive signal exhibits a sustained increase and the control fluid valve assembly position is at null.

58. (Original) The method of claim 57, in which the fault signal indicates a plugged primary orifice in the I/P converter.

59. (Original) The method of claim 57, in which the fault signal indicates a failure of an outlet O-ring in the I/P converter.

60. (Original) The method of claim 56, in which the fault signal is generated when the I/P drive signal exhibits a sustained decrease and the control fluid valve assembly position is positive.

61. (Original) The method of claim 60, in which the fault signal indicates a plugged nozzle in the I/P converter.

62. (Original) The method of claim 60, in which the control fluid valve assembly comprises a spool valve and the control fluid valve assembly position comprises a spool valve position.

63. (Original) The method of claim 60, in which the control fluid valve assembly comprises a pneumatic relay having a beam, and the control fluid valve assembly position comprises a beam position.